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THE RELATIONSHIP BETWEEN THE BENDER-GESTALT TEST AND THE MARIANNE FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION.

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Identifiers-Bender Gesalt Test, Harrison Reading Readiness Test, Marianne Frostig Developmental Test of Visual Perception

The relationship between the Bender-Gesalt Test was studied using the Koppitz Developmental Scoring System and the Marianne Frostig Developmental Test of Visual Perception in terms of age, sex, IQ, and socioeconomic status. A relationship to the Harrison Reading Readiness Test was also explored. Subjects were 89 first- and second-grade children (46 males and 43 females) grouped according to socioeconomic class--upper middle, lower middle, or lower. A relationship between low and average intelligence and test performance was noted. Lower socioeconomic classes gave a consistently poor performance in all test areas. It was concluded that the two tests were measuring, to some degree, the same behavior, and, because of their low reliability, it is suggested that they be used together to test perceptual development. Both perception tests were related to the reading readiness test. Specific test variations are noted; further research is recommended. Detailed data tables are included, and references are listed. (BS)

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THE RELATIONSHIP BETWEEN THE BENDER-GESTALT TEST AND THE MARIANNE FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION

Session: Thursday, April 25, 10:30-11:30 A. M. - Perception

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In order for the child to harvest his intellectual and educational potentials, he must successfully develop four basic psychological functions or abilities: (1) Sensory-motor; (2) Language; (3) Perception; and (4) Higher Cognitive Processes. These four abilities are thought to unfold in a definite sequential order with each interdependent upon the other (4).

Our concern here is with perception. Perceptual functions are of critical importance because "any educational or therapeutic program, whether it is mainly concerned with language, or thought processes, or feelings, or behavior, will have to be based on experience and, therefore, on perception." (9)

However, much difficulty exists in accurately measuring perceptual functions. There are many clinical instruments which purport to measure perceptual abilities, but most of these tests have not been standardized and few have been validated.

The purpose of this study was to explore the relationship between two clinical instruments, the Bender-Gestalt Test, using Koppitz Developmental Scoring System (6), and the Marianne Frostig Developmental Test of Visual Perception (2). Both tests are standardized and both attempt to measure perceptual functions. In addition, this study explored the relationship between these two tests and The Harrison Reading Readiness Test.

One of the many uses of the Bender-Gestalt Test is to make evaluations of perceptual-motor functioning and/or neurological dysfunction. The test consists of having a child copy nine geometric figures; his score depends on the accuracy with which he copies the figures. The Koppitz Scoring System provides criteria by which each drawing is evaluated. Each drawing is scored for errors; thus high total scores represent many errors. A maximum score of 30 is possible. The Koppitz Scoring System also provides age norms to which individual total scores can be compared.

The Developmental Test of Visual Perception[1] grew out of clinical observations of children with brain damage and/or learning disabilities at the Marianne Frostig School of Educational Therapy. The Test was designed to explore five areas of visual perception: eye-hand coordination, figure-ground perception, perception of form constancy, perception of position in space, and perception of spatial relationships.

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[1] Also referred to as the Frostig Test

The summation of the five subtests scaled scores results in a deviation score referred to as the Perceptual Quotient. The Perceptual Quotient (hereafter referred to as the PQ) has a median of 100, and percentile PQ's are somewhat consistent with IQ values of the Wechsler Intelligence Scale for Children. A PQ of 90 is thought to be required for learning to read (2).

Both the Bender-Gestalt Test (Koppitz) and the Developmental Test of Visual Perception are used in the diagnosis of learning disabilities to evaluate perceptual-motor functioning (8), (2).

The question asked in this study is what is the relationship of each test to the other. Culbertson and Gunn (1), using a hospital population of children age range 7.5-12.5 compared Koppitz scores on the Bender-Gestalt Test to scores on the Frostig Test. Subjects were divided into four groups: emotionally disturbed, schizophrenic, retarded, and organic brain syndrome. An overall correlation ($r = .52$, $p < .01$) was reported between the Bender-Gestalt Test (Koppitz) and the Frostig Test. It should be noted that the study employed a hospital population; also, whereas age norms are not available up to age 12.5, many of these children were in the older age ranges. The present study was concerned with investigating the relationship between the Bender-Gestalt Test and the Frostig Test in terms of age, sex, IQ, and socioeconomic status, using a typical school population.

Methods

The study was conducted in Lawton, Oklahoma. Two schools representing middle and lower socioeconomic class levels were randomly selected from eighteen elementary schools. Within each of these two schools, two classes, one first grade and one second grade, were randomly selected. Subjects for the study consisted of 89 children, 46 males and 43 females. Subjects were grouped into socioeconomic classes on the basis of a condensed version of Reiss' socioeconomic classification system (10). Three

socioeconomic levels were employed: upper middle class, lower middle class, and lower class (mainly children of parents receiving public assistance).

Intelligence

Intelligence was measured with the Peabody Picture Vocabulary Test.

Test Administration

The Developmental Test of Visual Perception was administered to each class as a group (3).

The Bender-Gestalt Test was also administered by group method. Transparencies were made from the Bender-Gestalt Test cards and were then projected on a screen by means of an overhead projector. Keogh and Smith (5) used a group method of administration and found no differences when compared to individual administration.

The Peabody Picture Vocabulary Test was individually administered to 44 children randomly selected from the original group.

The Harrison Reading Readiness Test was administered during the sixth week of school to the first graders by their classroom teachers.

Scoring of Tests

The Developmental Test of Visual Perception, the Peabody Picture Vocabulary Test, and the Harrison Reading Readiness Test are all objectively scored. The Bender-Gestalt Test protocols were scored independently by three raters. Raters A and B scored 89 protocols. Rater C scored 35 protocols randomly selected from the original group. The inter-rater reliability coefficient for Raters A and B was $r = .93$. Reliability coefficients between A and B and A and C were .95 and .92 respectively. All were significant.

Statistical Analysis

The Bender-Gestalt Test scores were transformed to standard scores by dividing the standard deviation appropriate for the age level into each Bender-Gestalt raw score. The standard score was then added to the number 10 in order to avoid negative numbers. It should be noted again that a high

Bender-Gestalt scale score indicated poor performance, while a low score indicates good performance.

Pearson product-moment correlations were used to determine the relationship between test scores on the Bender-Gestalt and the Frostig. Negative correlations suggest a positive relationship, due to the fact that the Bender-Gestalt is scored for errors.

Results

The overall correlation between PQ and Bender-Gestalt scores was $r = -.63$, $p < .001$. For females, a correlation of $r = -.69$, $p < .001$ was obtained and for males a correlation of $r = -.59$, $p < .001$. The relationship was, therefore, consistent for both sexes. (See Table I)

Age Factors

Correlation coefficients between PQ and Bender-Gestalt scores for the various age groups ranged from -.83 to -.29. All correlations were significant. (See Table I)

Intellectual Factors

The correlation between IQ and PQ was $r = .56$. The correlation between IQ and Bender-Gestalt scores was $r = -.55$. A partial correlation coefficient of $r = -.63$ was obtained between PQ and Bender-Gestalt scores, with IQ held constant. All correlations were significant at the .001 level.

When subjects were divided into three groups based on IQ scores (Low Group, IQ 67-89; Middle Group, IQ 90-109; High Group, IQ 110-128) the following correlations were noted between the Bender-Gestalt and the Frostig: Low IQ group, $r = -.78$ $p < .05$; Middle IQ group, $r = -.71$, $p < .01$. The correlation for the high IQ group was not significant. (See Table II)

Socioeconomic Factors

Correlations between PQ and Bender-Gestalt scores for the three socioeconomic groups ranged from -.54 to -.68. All correlations were significant. No sex differences were noted. (See Table III)

In comparing the mean performance of the three socioeconomic groups by t-test, it was noted that the lower class group was significantly lower in PQ and Bender-Gestalt scores than the two other socioeconomic groups. The lower class group was also significantly lower than the upper middle class group in IQ. There were no significant differences between the middle and the upper middle class groups. (See Table IV)

Reading Readiness

Both the Bender-Gestalt scores and the PQ's were related to the Harrison Reading Readiness Test. A correlation of $r = -.52 p < .001$ was obtained between the Bender-Gestalt Test and the Readiness Test; a correlation of $r = .62$, $p < .001$ was obtained between the Frostig Test and the Readiness Test.

Discussion

The overall correlation between the Bender-Gestalt Test scores and the PQ scores indicates a substantial relationship between the two tests. Although caution should be used in interpreting a correlation coefficient, the study does seem to indicate that the Developmental Test of Visual Perception and the Bender-Gestalt Test are measuring, to some degree, the same behavior. However, since both tests have low reliability, it may be suggested that both be used together to enhance the testing of perceptual development. In addition, since much variation is not accounted for and since validation studies are relatively lacking for both tests, the use of both tests together is further suggested.

The correlations reported still leave variations to be accounted for. The variance may be a function of the internal characteristics of each test. The Frostig contains 57 items, yielding a possible total raw score of 77; it takes between 30 and 45 minutes to administer. The Bender-Gestalt Test contains 9 items, yielding a possible total score of 30; it takes about 15 minutes to administer by group. Another possible source of variation is their low reliability. Variation may also stem from the fact that motoric ability is needed in the Bender-Gestalt Test, while Frostig has noted that such motor behavior is believed to be held to a minimum in the Frostig (3). However, Culbertson and Gunn (1) found that correlations between subtests 1 and 5 of the Frostig and the Bender-Gestalt Test were significant, while correlations between subtests 2, 3, and 4 and the Bender-Gestalt Test were not significant. Since subtests 1 and 5 of the Frostig seem to involve more motoric functions than do subtests 2, 3, and 4, it can be hypothesized on the basis of their study that the relationship which exists between the two tests may be due to motoric factors, while the variations between the two tests may stem from perceptual or other unknown factors. Further study into possible sources of variation between the two tests are necessary.

Age Factors

The relationship between the Bender-Gestalt Test and the Frostig Test is a substantial one between the ages of 6.0 and 8.0, with the exception of age 6.6-7.0. The investigator is unable to explain the lack of relationship for this age group. However, it is interesting to note that Koppitz found the greatest variation at this age level in Bender-Gestalt Test performance (6). She attributed this to a maturational spurt.

It would be interesting to correlate both the Bender-Gestalt and the Developmental Test of Visual Perception with measures of intelligence for each specific age group.

Intellectual Factors

Both the Bender-Gestalt Test and the Developmental Test of Visual Perception are moderately related to intelligence. These findings are in agreement with Culbertson and Gunn (1) and seem to give support to the hypothesis that perceptual factors are related to intelligence (or vice versa), or that both are related to some third factor. When intelligence was partialled out, Bender-Gestalt scores and PQ scores were still substantially related to each other.

The relationship between the Bender scores and the PQ scores was substantial and consistent over the low and average levels of intelligence. However, this was not true for the above average levels of intelligence. It is interesting to note that a substantial relationship ($r = -.73$, $p < .05$) exists for this same above average IQ group between IQ scores and Bender scores, but that the relationship between PQ and IQ for this same group was not significant.

Additional research on the relationship between perception and intelligence, on the one hand, and achievement, on the other hand, is recommended. Specifically, it might be interesting to explore the relationship between low perception scores (Bender scores and PQ's) and reading achievement scores of students with various levels of intelligence. Children with superior intellectual ability may not be that dependent on perceptual factors for reading achievement.

Socioeconomic Factors

The substantial relationship between the Bender-Gestalt Test and the Developmental Test of Visual Perception was consistent over the three socioeconomic levels. The consistently poor performance of the lower economic group on both tests should be noted. Such results suggest that

children from lower socioeconomic homes may be at a perceptual disadvantage, as well as a linguistic and social disadvantage. Such implications suggest a need for cross-validation. If these results were confirmed, they could have important implications for perceptual readiness training in the Head Start Program, especially in terms of the Frostig Training Program.

Reading Readiness

Both the Bender-Gestalt and Frostig Tests were related to the Harrison Reading Readiness Test. This suggests the possiblity of using the Bender-Gestalt in the classroom as a "rough" screening test for perceptual readiness. The Bender has the advantage of being economical in terms of time and money. Group administration takes between 15 and 20 minutes and all that is needed besides the Bender cards is white paper. Children who perform poorly on the Bender could then be given a Frostig Test. It is not suggested that the Bender replace the Frostig or Readiness Tests; rather, we are emphasizing that they might make good companions.

TABLE I

CORRELATIONS BETWEEN THE BENDER-GESTALT TEST AND THE FROSTIG TEST BY SEX AND BY AGE

Age Group	Sex	N	Bender and Frostig
6.0-6.5	M&F	29	-.83 ***
6.6-6.11	M&F	19	-.29 *
7.0-7.5	M&F	23	-.72 ***
7.6-7.11	M&F	18	-.69 **
Total	M	46	-.59 ***
	F	43	-.69 ***
	M & F	89	-.63 ***

* Significant at the .05 level.
** Significant at the .01 level.
*** Significant at the .001 level.

TABLE II

CORRELATIONS BETWEEN THE FROSTIG AND THE BENDER-GESTALT FOR DIFFERENT LEVELS OF INTELLECTUAL ABILITY

Intelligence Group	N	PQ and Bender	IQ and Bender	IQ & PQ
Low	13	-.78 *	———	———
Middle	21	-.71 **	———	———
High	10	-.23 a	-.73 *	-.32 a

a not significant
* significant at the .05 level
** significant at the .01 level

TABLE III

CORRELATIONS BETWEEN THE FROSTIG AND THE BENDER-GESTALT BY SOCIOECONOMIC LEVELS

Socioeconomic Group	N	Bender and Frostig
Lower class	21	-.54 ***
Middle class	45	-.68 ***
Upper middle class	30	-.60 ***

*** significant at the .001 level

TABLE IV

COMPARISON OF MEAN PERFORMANCE ON THE BENDER-GESTALT TEST, THE DEVELOPMENTAL TEST OF VISUAL PERCEPTION (PQ), AND THE PEABODY PICTURE VOCABULARY TEST (IQ) BY SOCIOECONOMIC LEVEL

Socioeconomic Status	N	Mean IQ	N	Mean PQ	Mean Bender
Lower class	13	93.166	21	92.476	11.0308
Middle class	18	99.722 a	45	100.844 **	10.1560 **
Lower class	13	93.166	21	92.476	11.0308
Upper middle class	13	105.346 *	30	105.133 ***	10.0038 ***
Middle class	18	99.722	45	100.844	10.0560
Upper middle class	13	105.346 a	30	105.133 a	10.0038 a

a Difference between means not significant
* Difference between means significant at the .05 level.
** Difference between means significant at the .02 level.
*** Difference between means significant at the .01 level.

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